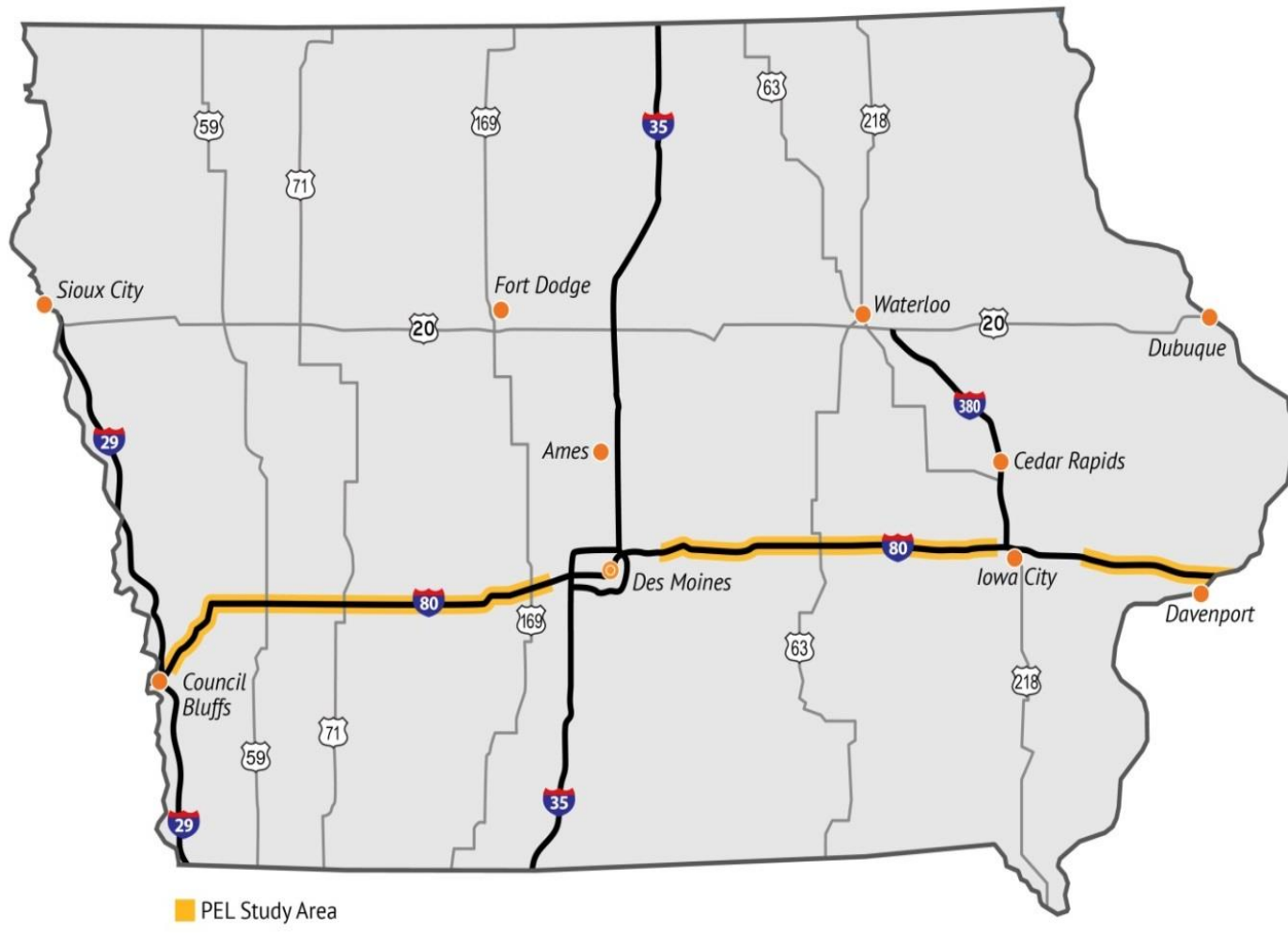


I-80 Planning (PEL) Study

Office of Location and Environment

Study Area



Make System decisions that affect improvement strategies along the entire corridor:

- What are the visions and goals for the I-80 system?
- What is the right size of the I-80 system?
- Should alternative financing strategies be used?
- What is the potential cost to reconstruct the system?
- How do we prioritize I-80 into projects?

The Benefits

- Gives us a systematic and dynamic plan for reconstructing all of I-80
- Answers big picture questions that have to be answered in lower level NEPA documents
- Builds consistency in approach across the system
- Let's us investigate financing and quantify the benefits and costs
- **Does not tie our hands financially...allows flexibility**

Schedule & Status Tech Memos

★	1	Public Involvement Plan	DONE	IN HOUSE
★	2	Overhead Bridges	DONE	IN HOUSE
★	3	Guiding Principles	DONE	IN HOUSE
★	4	Truck Accommodation	DRAFT out for review	IN HOUSE
★	5	Diversion Strategies	DRAFT out for review	IN HOUSE
★	6	Modal	DRAFT out for review	CONSULTANT
★	7	Automated Vehicles	DRAFT due April	CONSULTANT
		• Tolling & Alt. Financing	DRAFT due July	CONSULTANT
		• Resiliency and Vulnerability	DRAFT due June	CONSULTANT
		• Existing Conditions Analysis	DRAFT due October	CONSULTANT
		• Vision for Infrastructure Invest.	Draft due end of 2017	CONSULTANT

Public Involvement Upcoming Events



Public Meeting #1 Complete July 2016

Public Meeting #2 - Scheduled July 15, 2017

Public Meeting #3 - Scheduled November 30, 2017

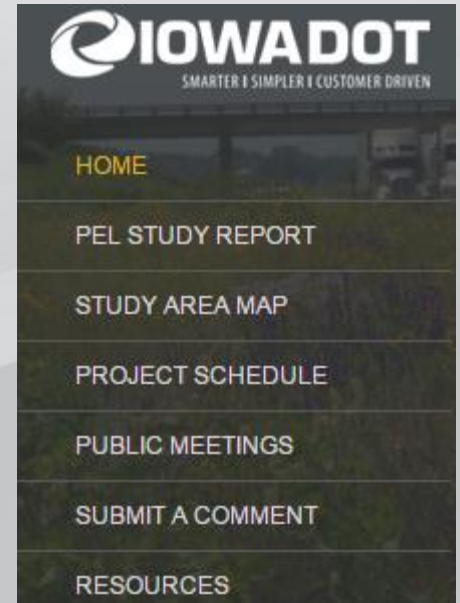
Public Feedback

Project Website

<http://www.iowadot.gov/interstatestudy/>

Purpose of the website:

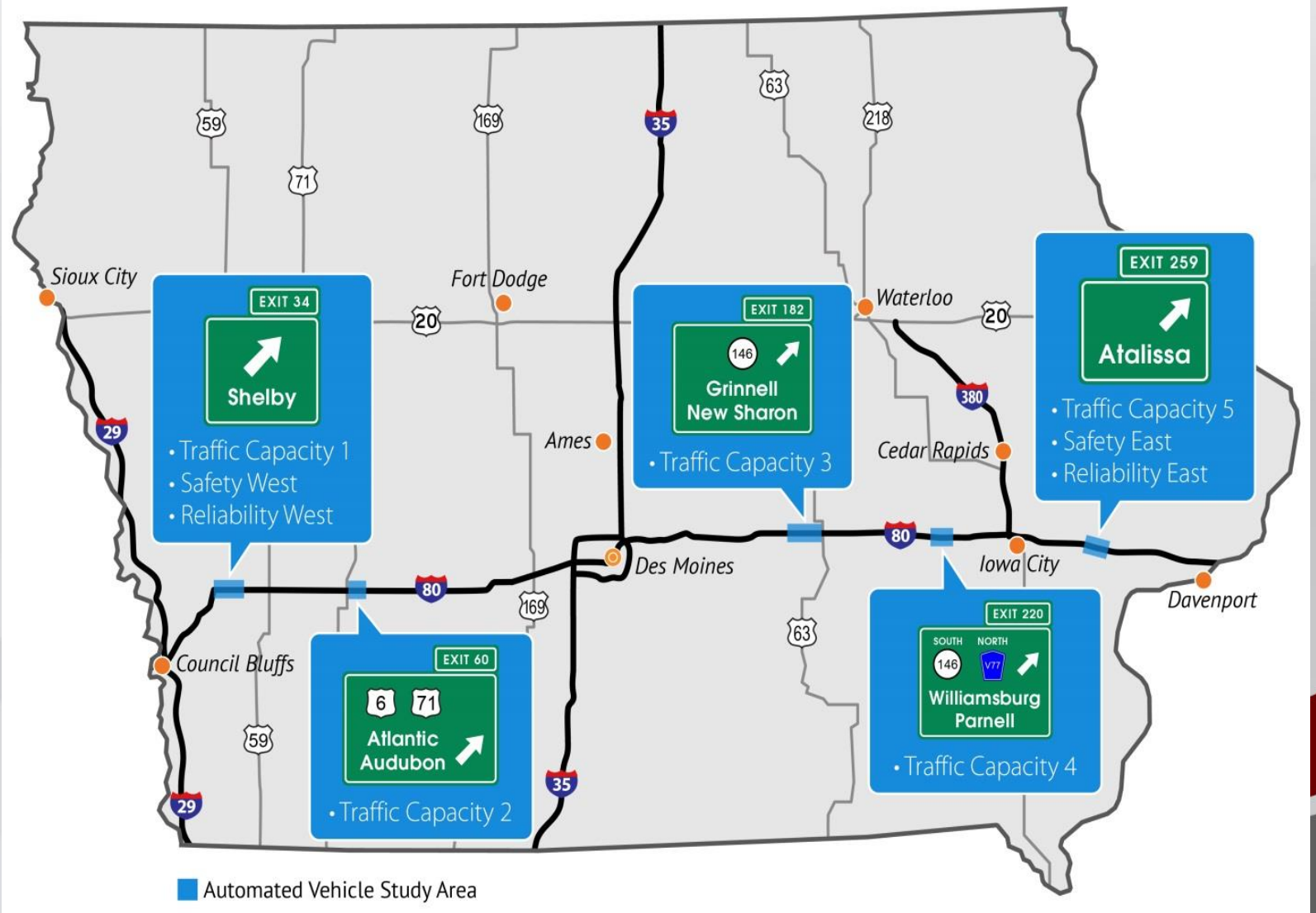
- Source for the public, resource agencies, local officials, etc. to sign-up to and stay connected
 - **Over 1,100 Subscribers**
- Early involvement in the transportation planning process
- I-80 system users' can share their opinions and fill out a survey
 - **Over 3,000 surveys filled out**



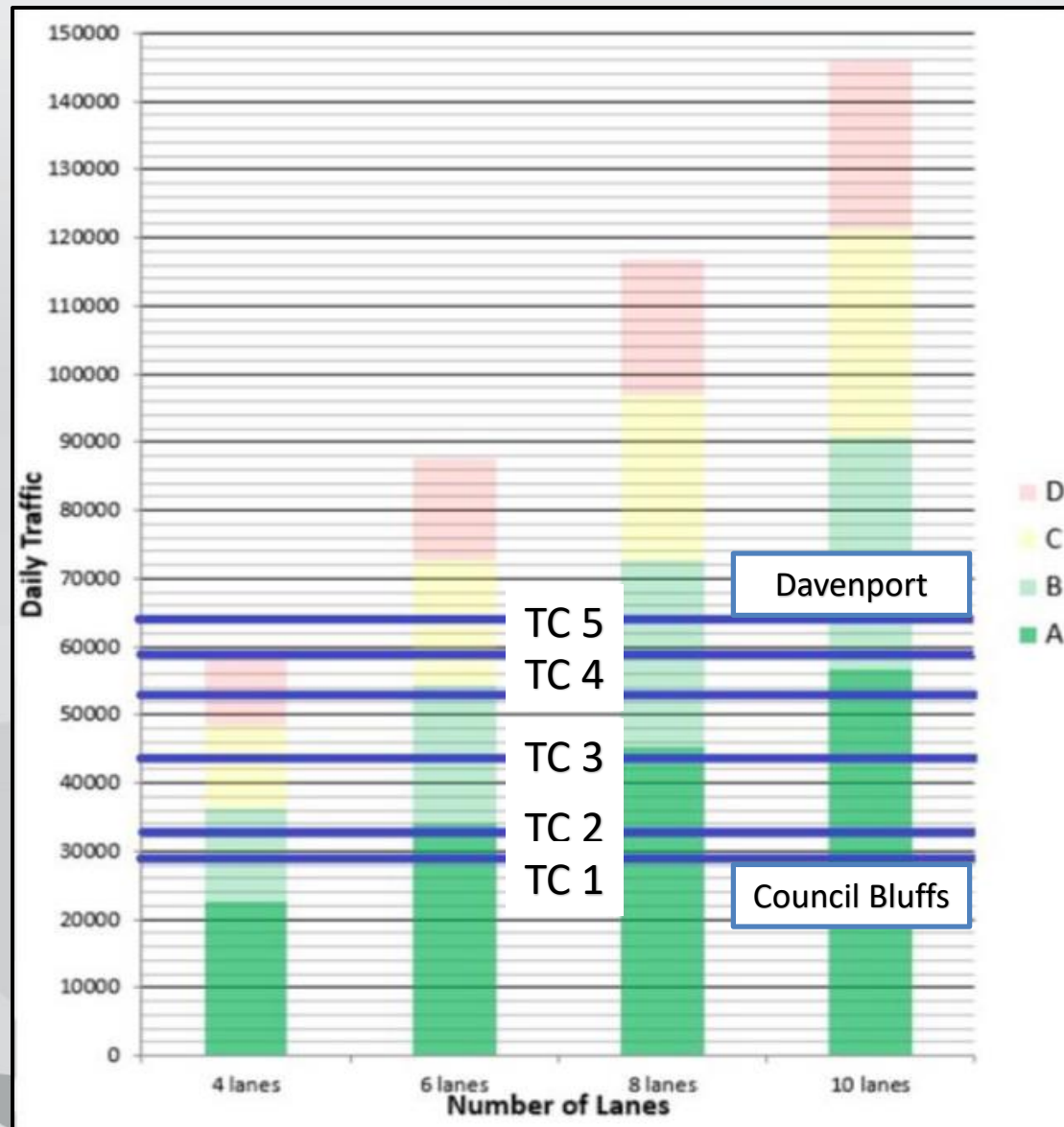
4 - Truck Accommodation



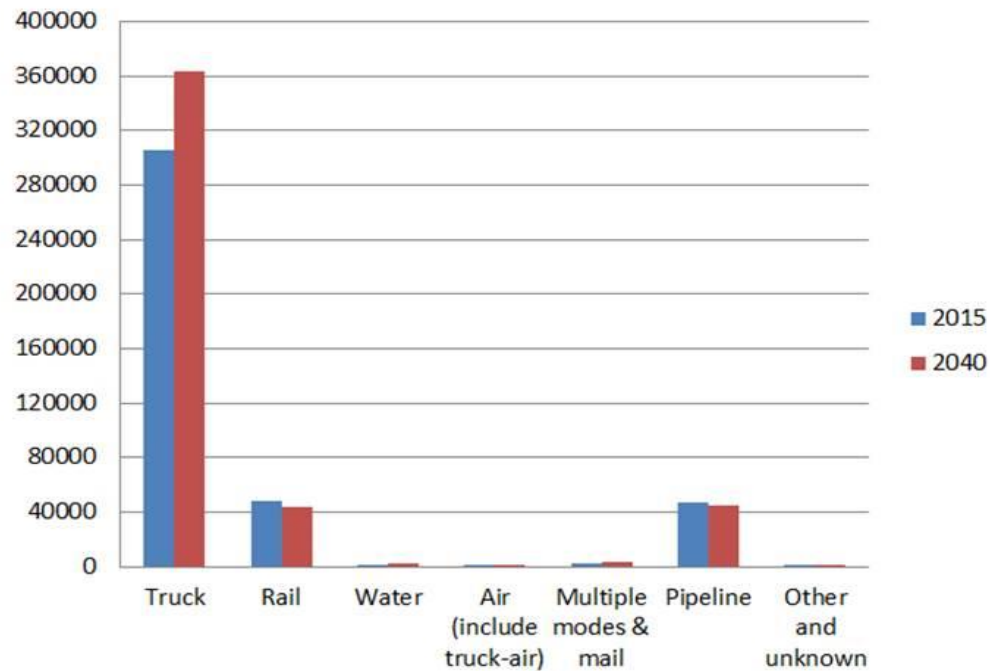
- Draft Complete - Under Review
- Considerations
 - Additional travel modes
 - Speed Differentials
 - Truck restrictions
 - Truck exclusive facilities



Traffic Projections



Freight Movement



Truck Volumes

XX % TRUCK %
XX % GROWTH %

Location	2014		2040		
	AADT (vpd)	Truck Volume	AADT (vpd)	Truck Volume	
1.5 miles west of County Road M16 Pottawattamie County	23,500	35%	8225	41% 49%	COUNCIL BLUFFS
			33,104 37%	12,248	
2.0 miles east of US 71 Cass County	20,100	39%	7839	47% 51%	DES MOINES
			29,585 40%	11,834	
1.0 miles west of US 63 Poweshiek County	26,500	35%	9275	70% 75%	DES MOINES
			44,962 36%	16,186	
2.0 miles east of IA 149 Iowa County	31,200	31%	9672	72% 83%	IOWA CITY
			53,610 33%	17,691	
2.5 miles east of County Road X40 Cedar County	33,500	35%	11,725	93% 104%	IOWA CITY
			64,774 37%	23,966	
1.5 miles east of Middle Road Scott County	30,800	30%	9,240	91% 85%	DAVENPORT
			58,974 29%	17,102	

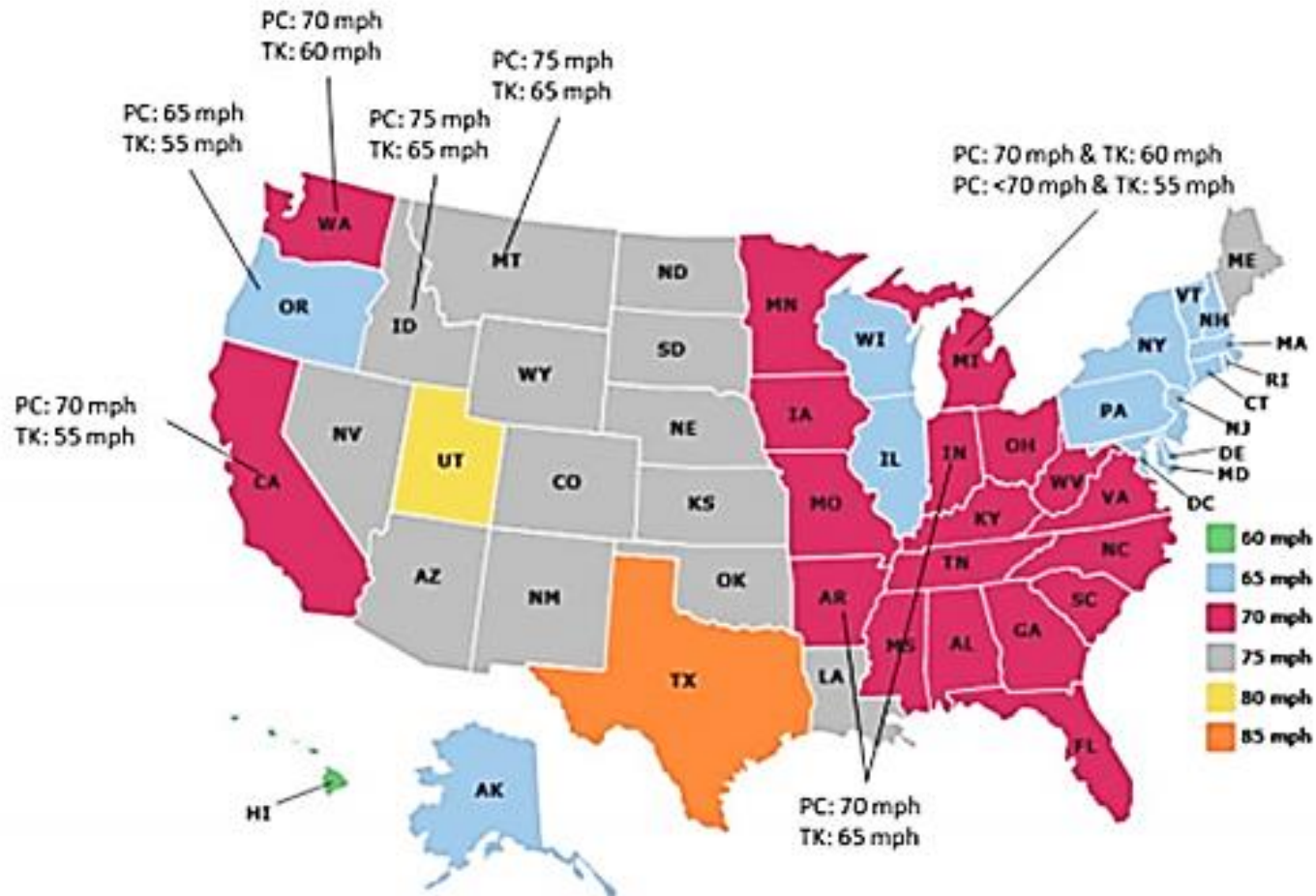
Truck Accomodation

Additional Modes

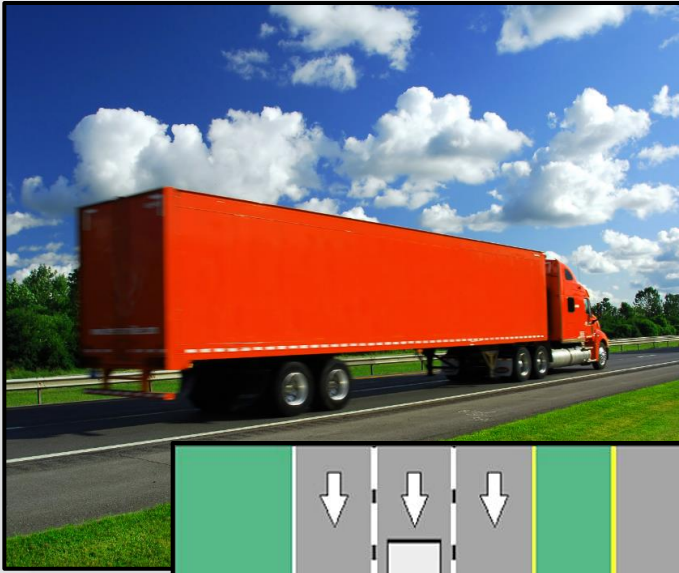


Truck Accomodation

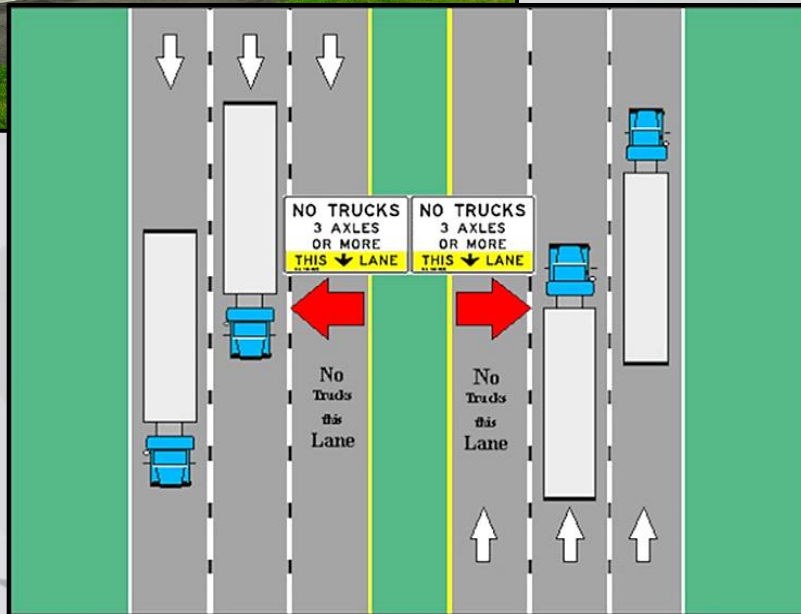
Speed Differential



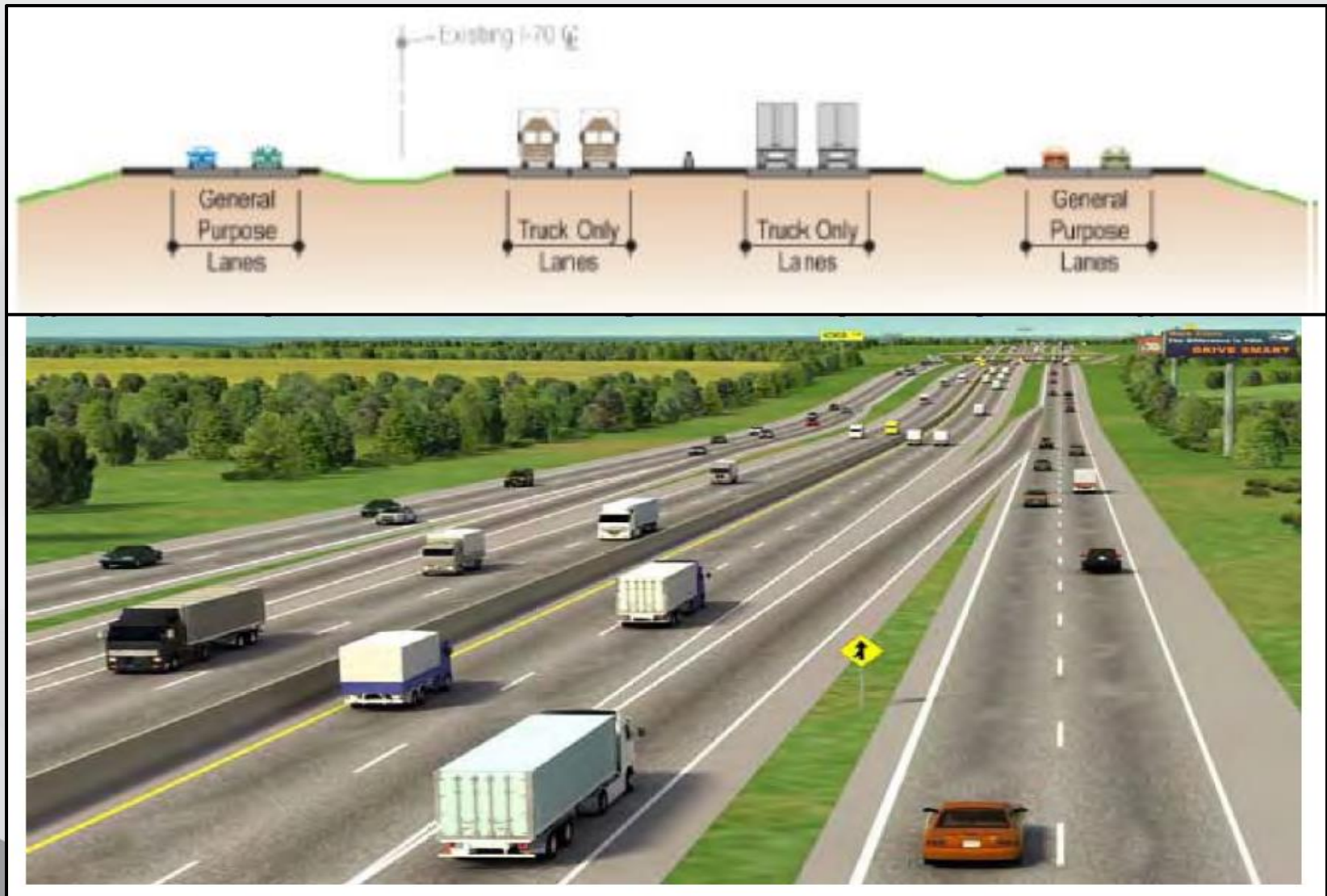
Truck Restrictions



- Total Ban or by class
- Limiting lane usage
- Limiting time of access



Truck Exclusive Facilities



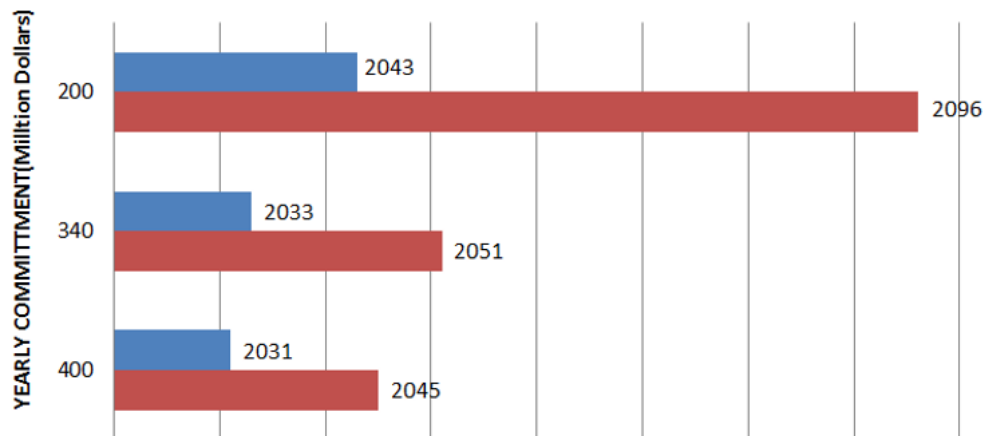
Costs

TABLE 3. CONSTRUCTION AND MAINTENANCE COSTS

Scenario	2015 Construction Cost (per Mile)	2012 Maintenance Cost (per Mile) ⁽¹⁷⁾
6 General Purpose Lanes	\$ 11,800,000	\$ 93,223
8 General Purpose Lanes	\$ 13,200,000	\$ 118,741
4 General Purpose Lanes plus 4 Truck-Only Lanes	\$ 23,400,000	\$ 130,733
6 General Purpose Lanes plus 4 Truck-Only Lanes	\$ 25,500,000	\$ 155,751

FUNDING SCENARIOS

2% Annual Construction Cost Escalation



Year of Completion with 2022 Start

■ 6 GP Lanes ■ TRUCK LANE ALTERNATIVE

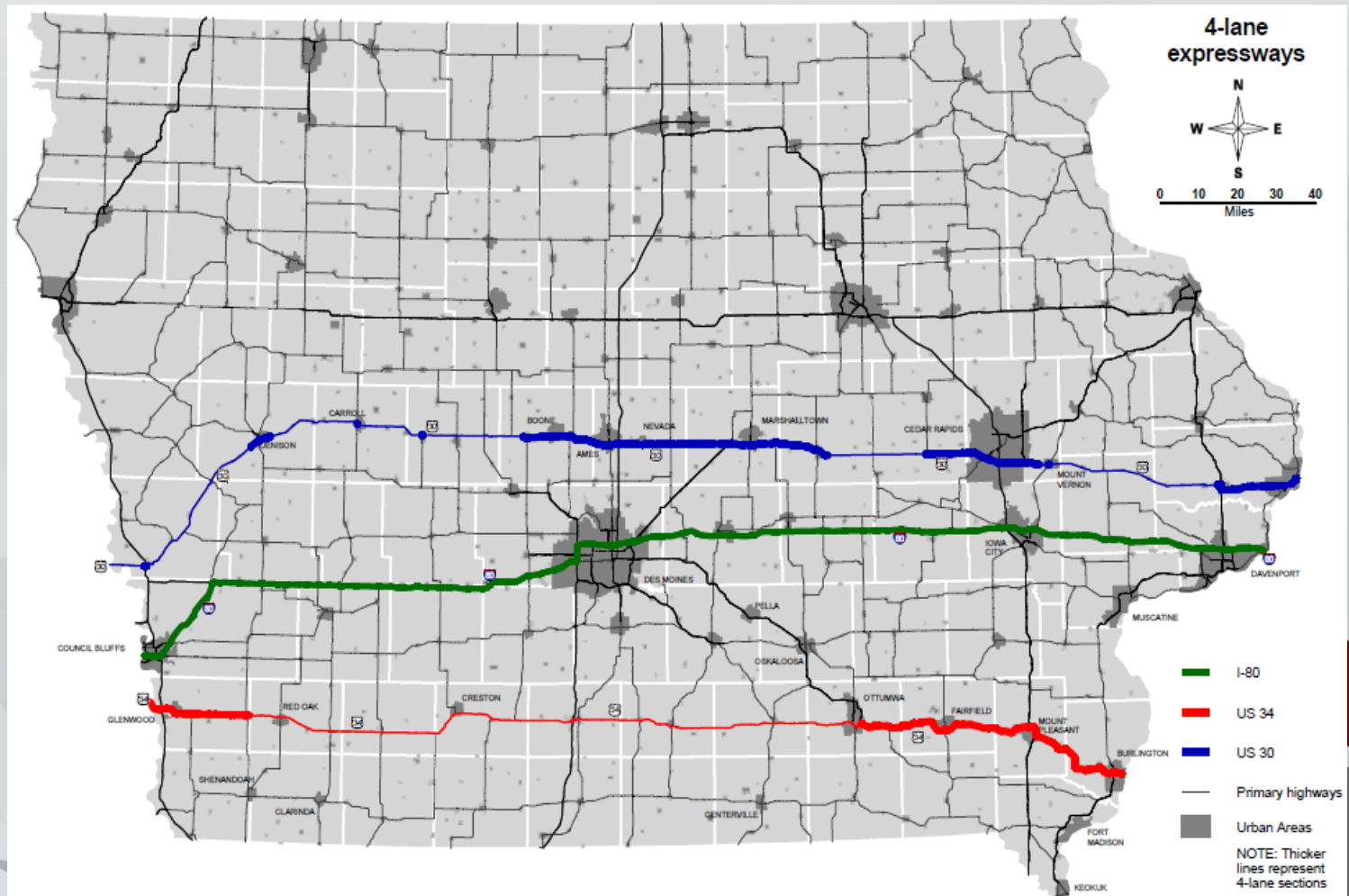
Truck Accommodation

5 - Diversion Strategies



- Draft Complete - Under Review
- Will improvements on parallel corridors divert enough traffic from I-80?
 - U.S. 30
 - U.S. 34
- Criteria Evaluated
 - Cost
 - Traffic Analysis
 - Cost vs Utilization
 - Economic Impacts
 - Affordability
 - Environmental Impacts

4-Lane Segments



Criteria Evaluated - Traffic Analysis

Five Scenarios analyzed by Systems Planning for impacts to:

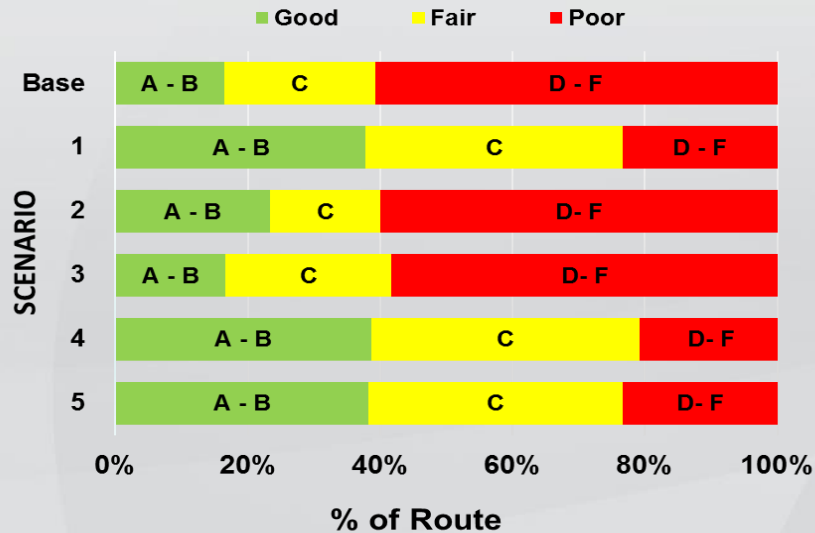
- Level of Service
- Daily Vehicle Miles Traveled (VMT)
- Daily Percent Change in Delay

Table 4. TRAFFIC SCENARIOS

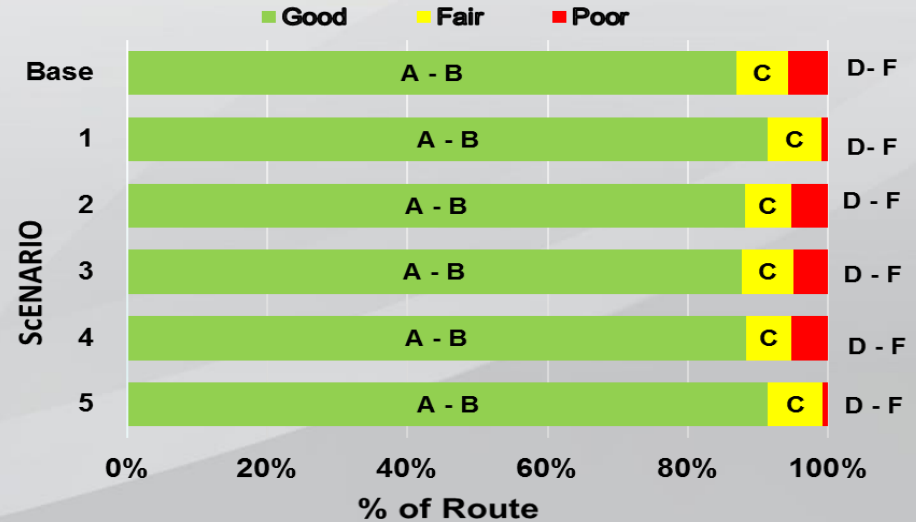
Scenario	Interstate 80	U.S. 30	U.S. 34
Base	No Build	No Build	No Build
1	6 Lanes	No Build	No Build
2	No Build	4 Lanes	No Build
3	No Build	No Build	4 Lanes
4	6 Lanes	4 Lanes	No Build
5	6 Lanes	No Build	4 Lanes

Level of Service (LOS)

I-80 LOS



U.S. 30 LOS



U.S. 34 LOS



LOS D - F
I-80 – 60%
U.S. 30 - 5%
U.S. 34 – 1%

Diversion Strategies

Vehicle Miles Traveled (VMT) and Delay

Key Points

- VMT on I-80 decreases by 1.5% and 4.5% for scenarios #2 and #3 respectively; 60% of I-80 operating at a LOS of D or worse.
- VMT increased by significant numbers on U.S. 30 and U.S. 34 they still operated well regardless if any capacity improvements were made.

Scenario	Description	Cost (\$Millions)	All Corridors	Cost / Decreased Daily Delay (\$/Hr)
			Total Daily Delay (hours)	
Base	No Build	NA	55,709	NA
1	6-Lane I-80	3,400	41,741	240,000.00
2	4-Lane US 30	1,500	53,134	580,000.00
3	4-Lane US 34	1,500	52,225	430,000.00
4	6-Lane I-80 & 4-Lane US 30	4,900	39,838	300,000.00
5	6-Lane I-80 & 4-Lane US 34	4,900	41,707	350,000.00

Observation

Will improvements on other corridors divert enough traffic from I-80?

It does not appear that enough traffic will divert from I-80 to the other corridors and address the future traffic demands of the system.

7 -Automated Vehicles & Emerging Technology



- Draft Complete - Under Review
- Evaluate the effect of automated vehicles and emerging technology on:
 - Safety
 - Capacity & Operations
 - Travel Time Reliability
 - Design Elements

For on-road vehicles



Human driver



Automated system

Steering and
acceleration/
deceleration

Monitoring
of driving
environment

Fallback when
automation
fails

Automated
system is in
control

0

NO
AUTOMATION



N/A

1

DRIVER
ASSISTANCE



SOME
DRIVING
MODES

2

PARTIAL
AUTOMATION



SOME
DRIVING
MODES

3

CONDITIONAL
AUTOMATION



SOME
DRIVING
MODES

4

HIGH
AUTOMATION



SOME
DRIVING
MODES

5

FULL
AUTOMATION



Human driver
monitors the road

Automated driving system
monitors the road

Levels of Autonomy

GM "Super Cruise"
2017 Cadillac CT6



Tesla Model S



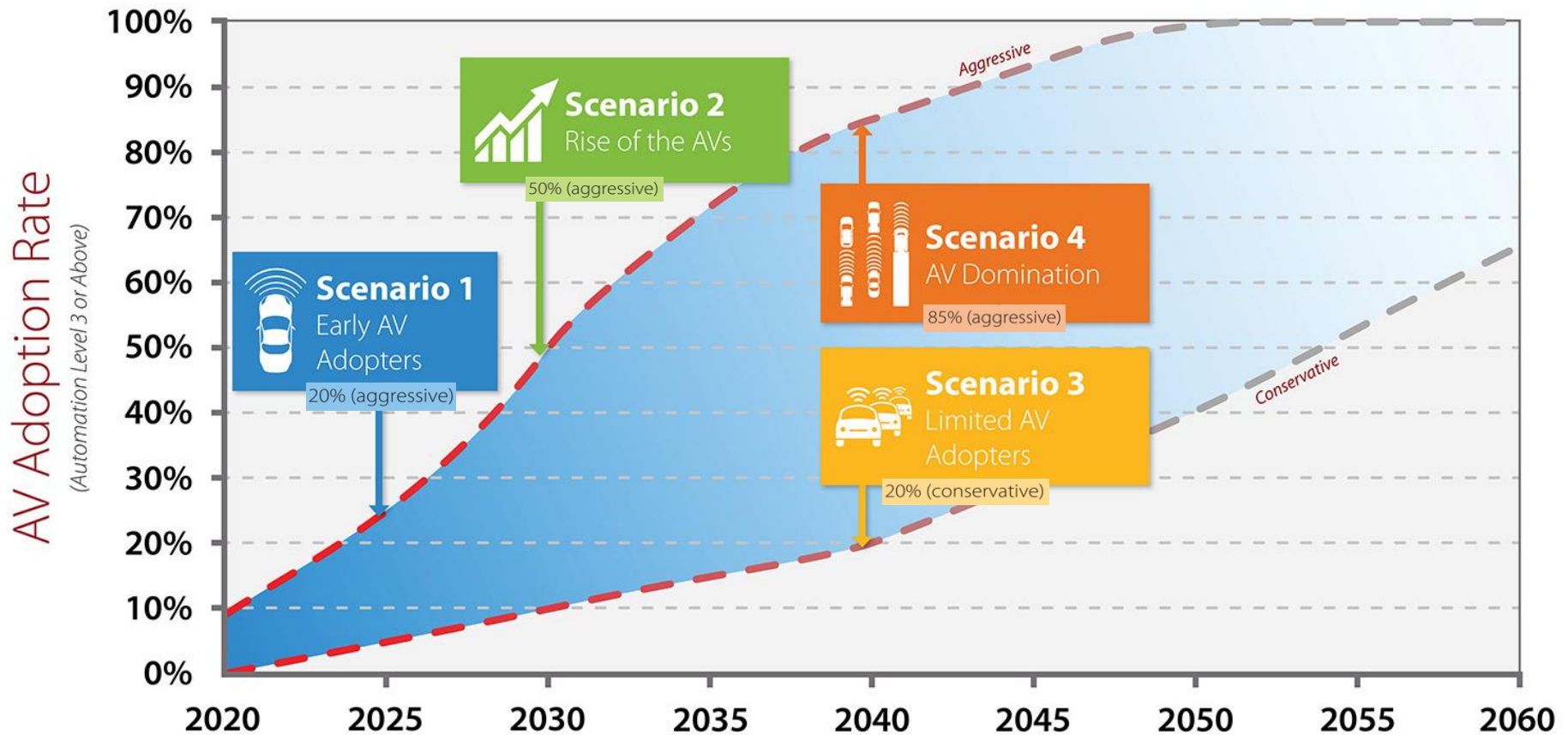
Waymo (Google)



Emerging Technology

Adoption Rates

Automated Vehicle (AV) Market Adoption

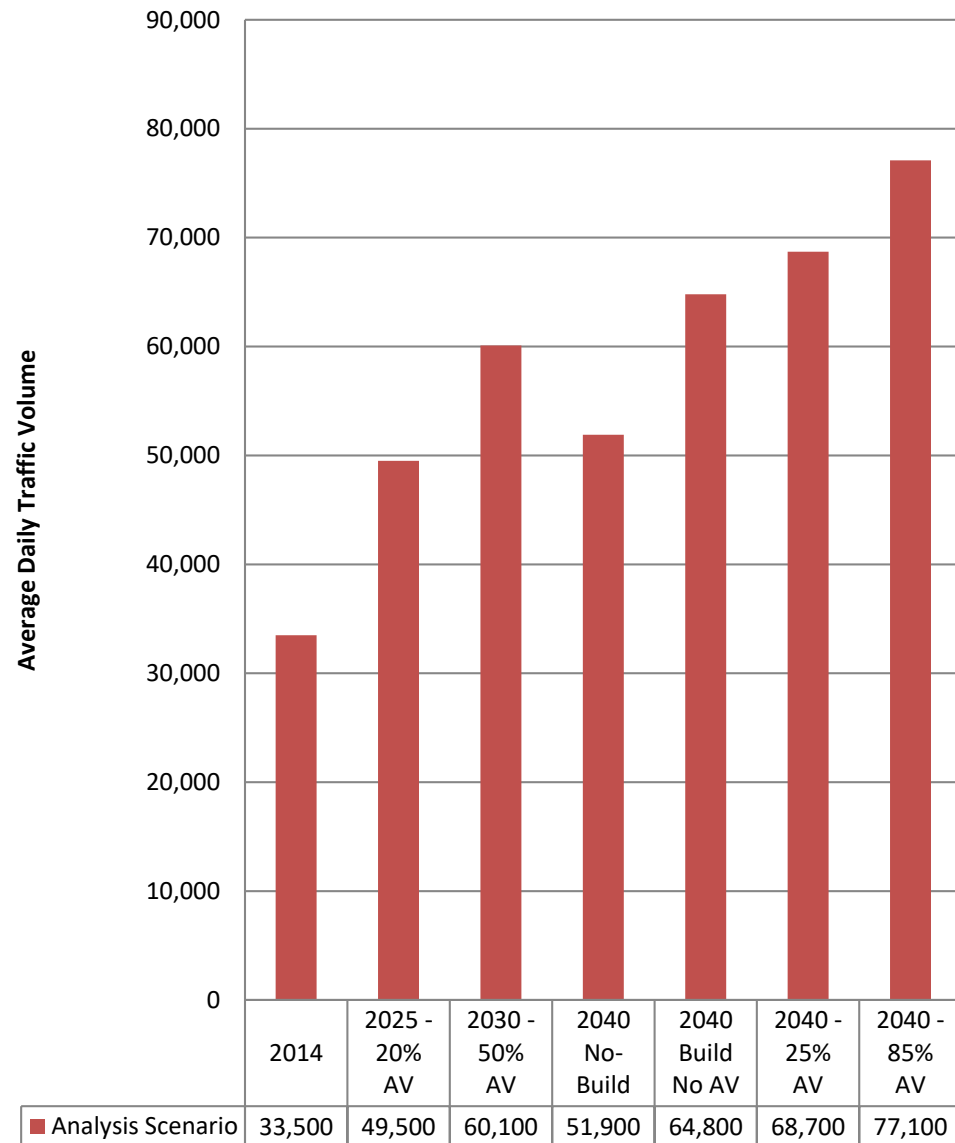


The I-80 Planning Study and market adoption rates and impacts of vehicle automation are informed by industry leading research by University of Texas, University of California at Berkeley, Victoria Transportation Policy Institute and Goldman Sachs. The scenarios ranged from conservative to aggressive in market adoption.

Traffic Analysis

- DOT Statewide travel model runs
 - 2040 4-lane I-80
 - 2040 6-lane I-80
- Research on AV impact to demand
 - Induced trips due to AV
 - Potentially longer trips as well

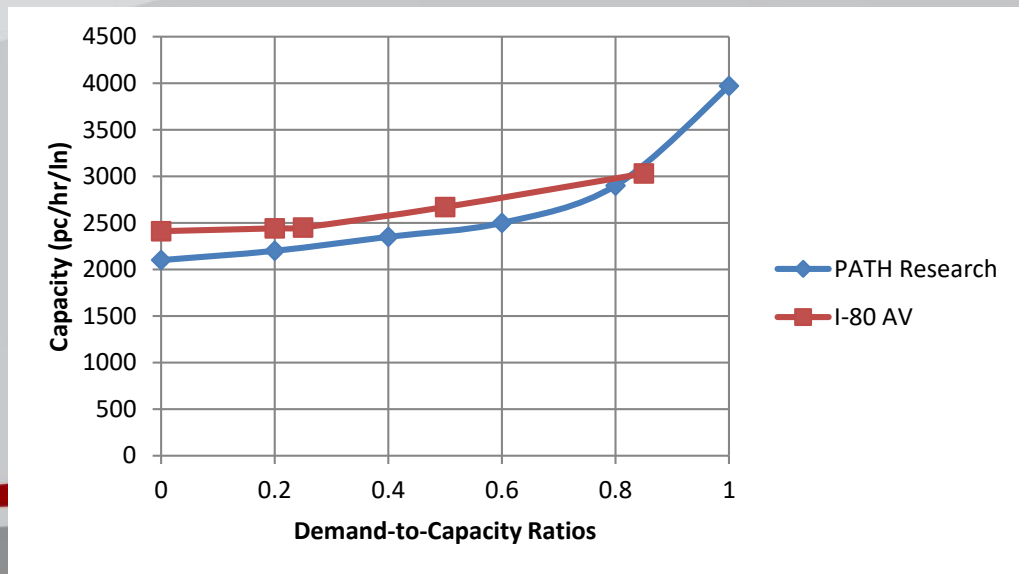
Traffic Demand by Future Year and AV Market Penetration

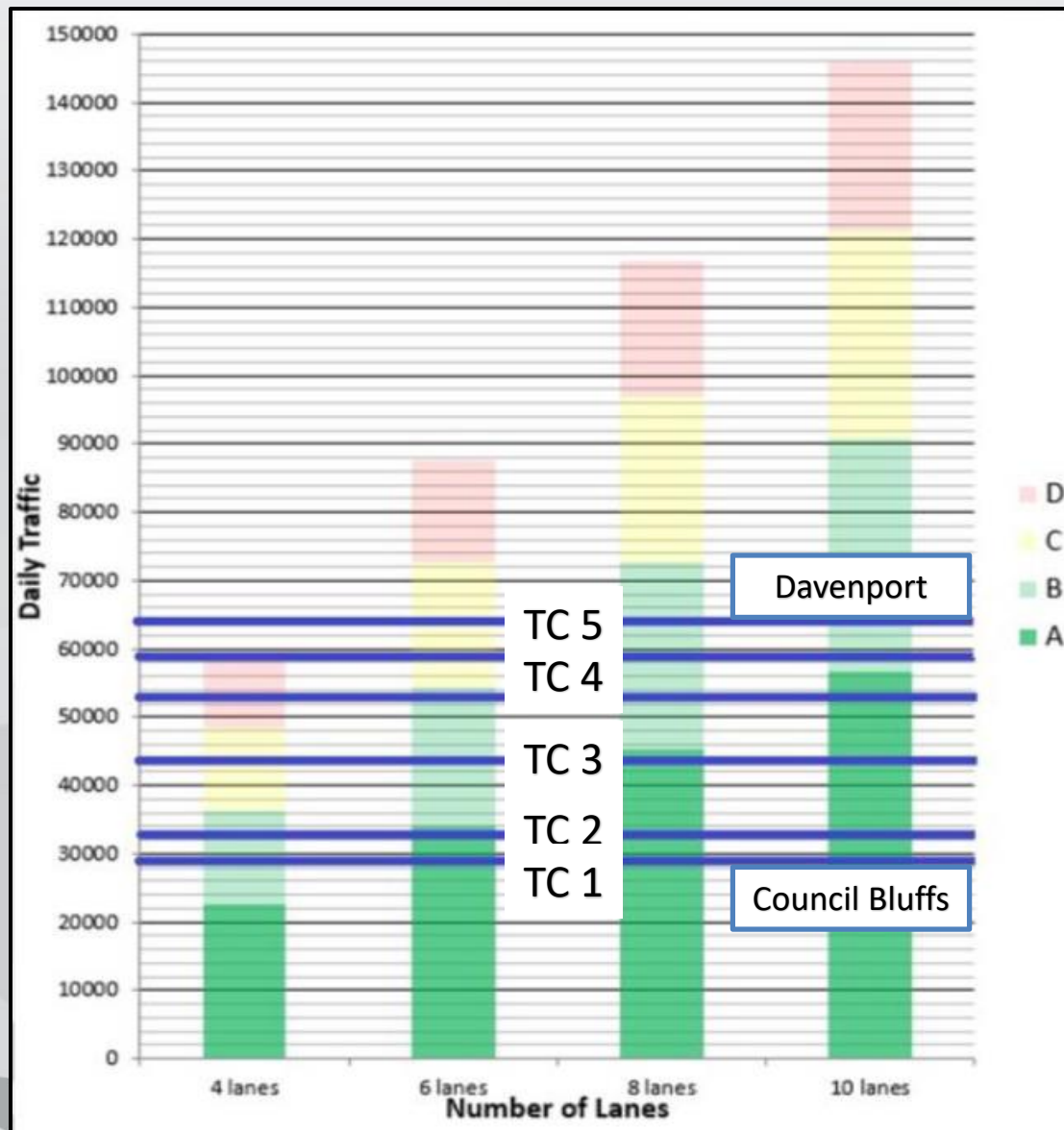


Traffic Analysis Results

- Simulated capacity with AV
 - Default VISSIM driver behavior
 - AV traffic mixes with non-AVs in all lanes
- Benefits reach substantial level at 50% AV
- 85% AV – A 6-lane freeway can serve roughly 1,800 additional vehicles during the peak hour
- Dependent on vehicle following / platooning code; likely to change over time

Scenario	% AV	Capacity (pc/mi/ln)
No-Build	0%	2,410 (+0%)
Scenario 1	25%	2,450 (+2%)
Scenario 2	50%	2,670 (+11%)
Scenario 3	20%	2,440 (+1%)
Scenario 4	85%	3,030 (+26%)





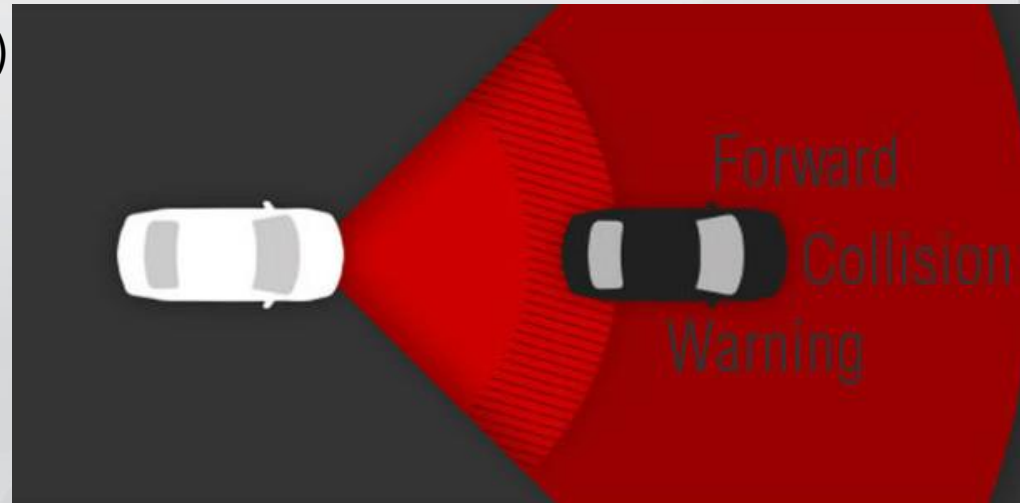
Safety Analysis

Automated Vehicle Safety

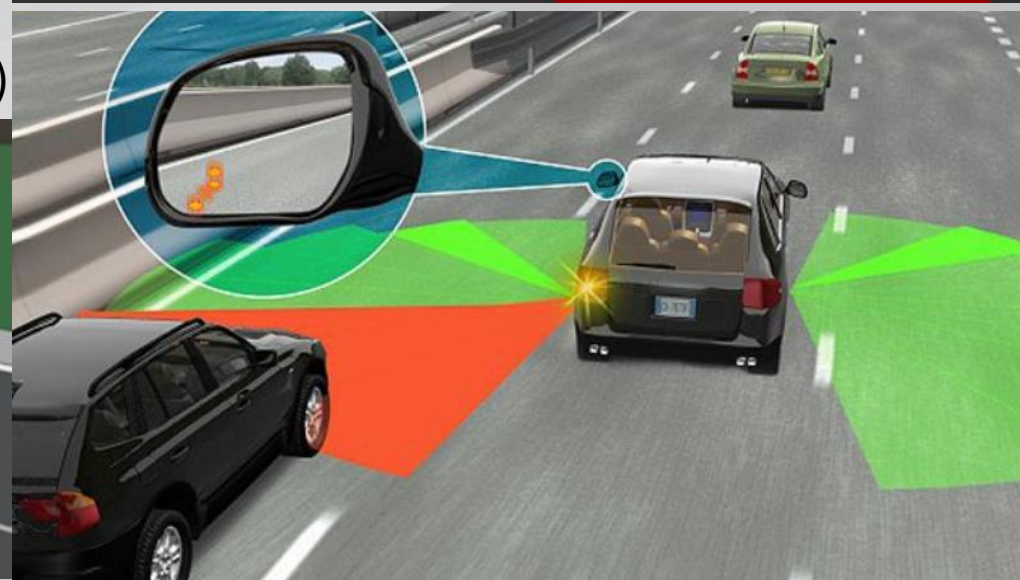
Safety applications

- 1) Forward Collision Warning
- 2) Lane Change Warning
- 3) Cooperative Adaptive Cruise Control

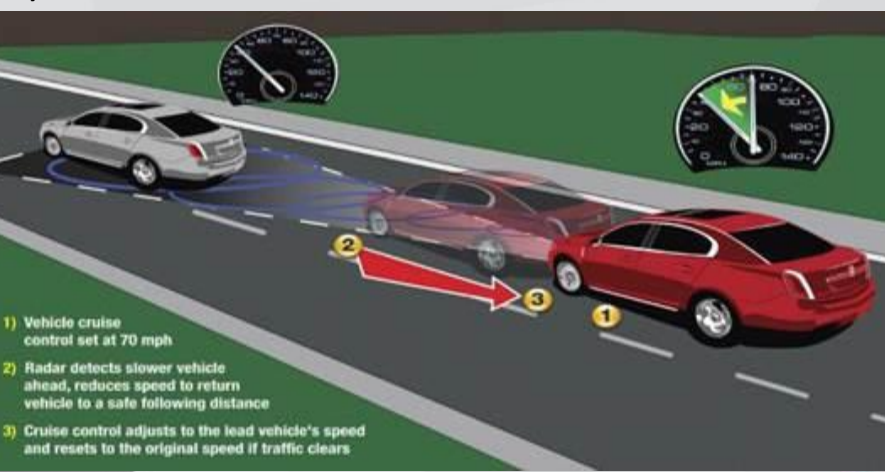
1)



2)

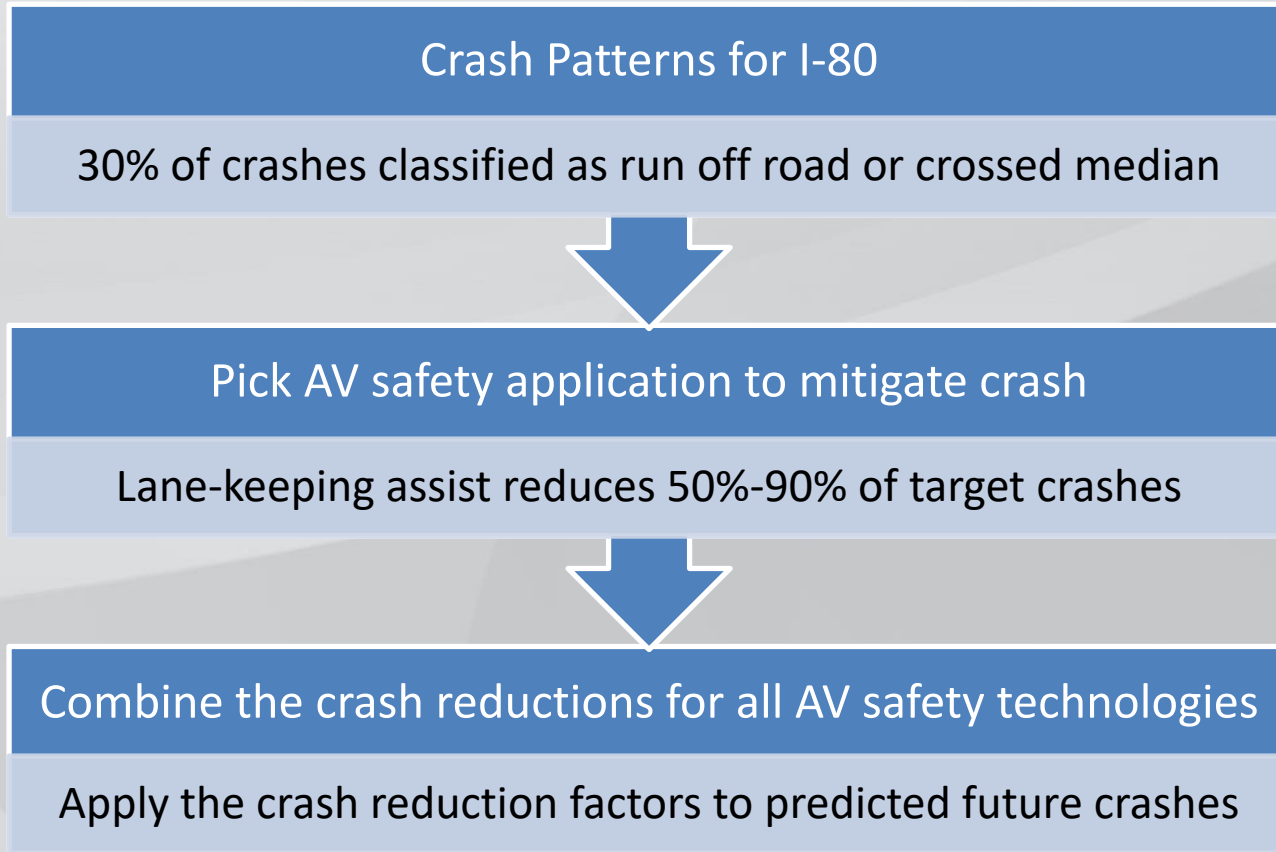


3)



- 1) Vehicle cruise control set at 70 mph
- 2) Radar detects slower vehicle ahead, reduces speed to return vehicle to a safe following distance
- 3) Cruise control adjusts to the lead vehicle's speed and resets to the original speed if traffic clears

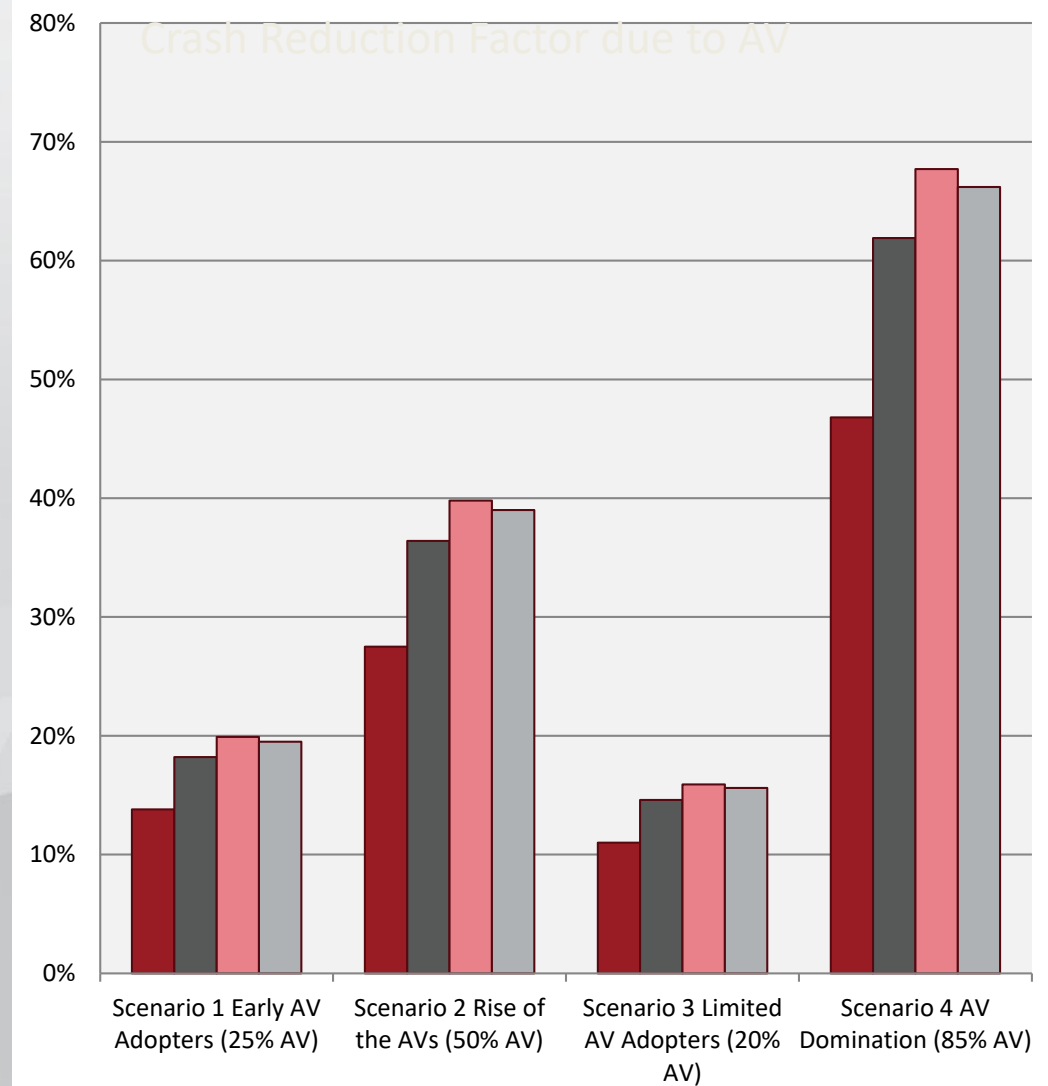
Safety Analysis Approach



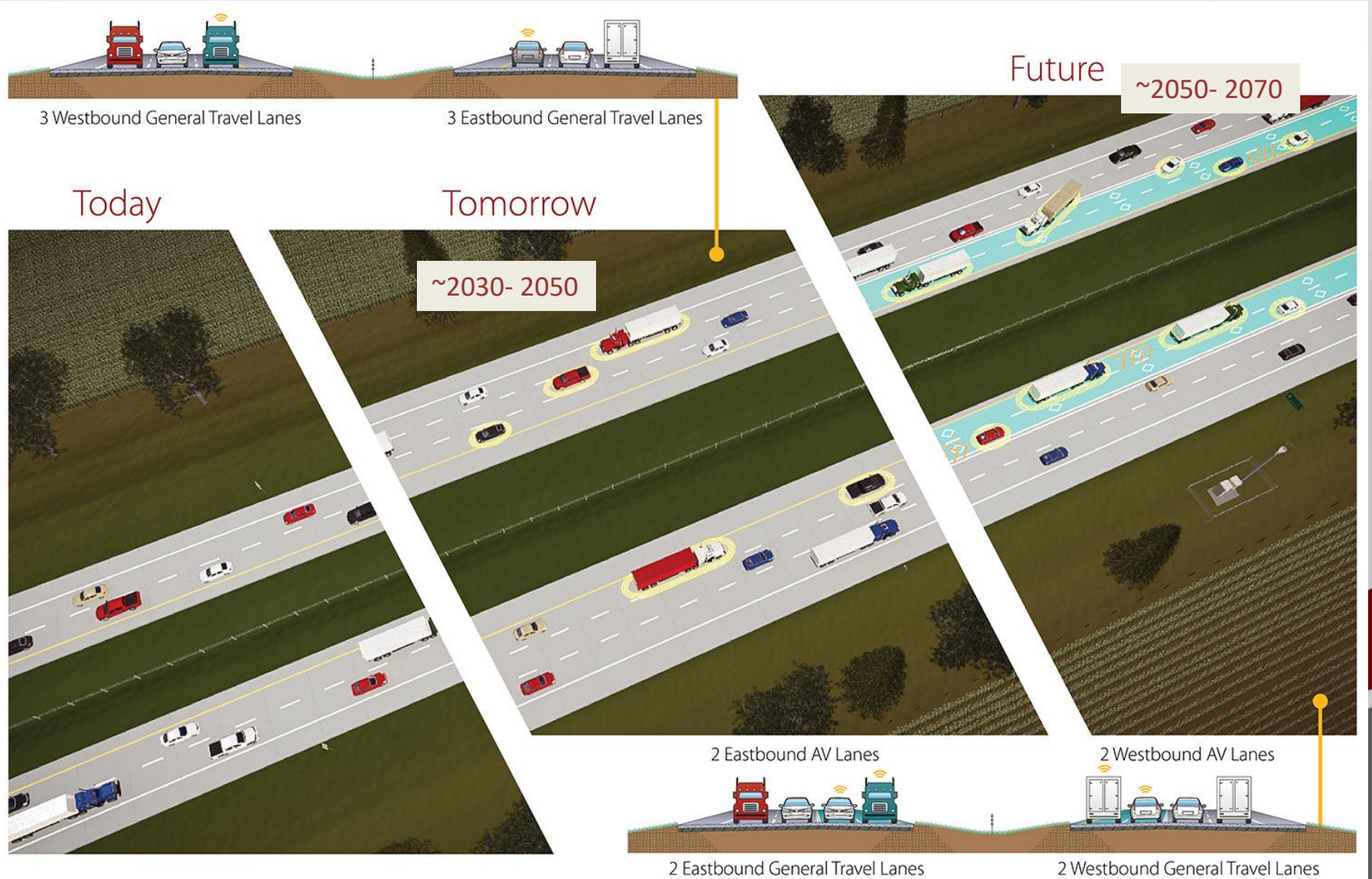
Safety Analysis Results

I-80 Predicted Crash Rates

- Introducing automated vehicles reduces crashes
- Reductions near 70% of total crashes for 85% AV
- Location-specific estimate & conservative
 - Future study may show even higher benefits, especially for other locations (e.g. intersections)



Design Elements



Emerging Technology

STUDY RESULTS

2040 Scenarios versus Existing Conditions

Data based on studies and analyses of two to five general segments of rural I-80.

SAFETY

TRAFFIC CAPACITY

RELIABILITY

4-Lane I-80
UNIMPROVED IN THE YEAR 2040



Average **crashes** per mile will **increase 9%** with little change to the number of **fatal** and **major injury crashes***



*(with a 48% increase in volumes)

Vehicle crowding will increase by **55%**



causing **average speeds** to decrease **5%**



Overall **travel times** will grow, increasing the **Misery Index**



6 to 12%



6-Lane I-80
IMPROVEMENTS



Average **crashes** per mile will **increase 14%** with little change to the number of **fatal** and **major injury crashes***

*(with a 72% increase in volumes)

20% less vehicle crowding



and average speeds **remain the same** as today

Misery Index



Slight improvement

1 to 8%

6-Lane I-80 with AV
IMPROVEMENTS



Average **crashes** per mile will **decrease 59%** and **fatal** and **major injury crashes** will **decrease 50%***

*(with a 104% increase in volumes)

35% less vehicle crowding



and average speeds **increase 2%**



Misery Index



More improvement

-1 to 3%

I-380 Planning Study (PEL)

Office of Location and Environment

Make System decisions that affect improvement strategies along the entire corridor:

- What are the visions and goals for the I-380 system?
- What is the right size of the I-380 system?
- Are there operational improvements that will buy us time before infrastructure investment is needed?
- What do emerging technologies buy us in terms of life of the system?
- What is the potential cost to reconstruct the system?
- How do we prioritize I-380 into projects?

The Largest Benefits to IDOT

- Ties it all together
- Builds consistency in approach
- Gives us a systematic and dynamic plan for reconstructing I-380
- Answers big picture questions that have to be answered in lower level NEPA documents
- **Allows Flexibility for Implementation**

Schedule & Status Tech Memos

• Public Involvement Plan	DONE not released	IN HOUSE
• Goals and Guiding Principles	DRAFT out for review	IN HOUSE
• Existing Conditions & Operations	DRAFT due July	CONSULTANT
• Viability of Modal Options	DRAFT due August	CONSULTANT
• Automated Vehicles	DRAFT due October	CONSULTANT
• Resiliency and Vulnerability	Scope Under Development	CONSULTANT
• Vision & Final Recommendations		CONSULTANT

Public Involvement

Public Meetings

- Summer 2017 (online)
- Winter 2017 (online)
- Spring 2018 (in person and online)



QUESTIONS ???